FOOD INNOVATION
Research Infrastructure

Fostering innovations in the Agri-Food Sector

A research infrastructure to explore the potential of food biotechnology

Friday 19 November 2021

Online workshop

Valorization of Food industry Wastes and Rapid Test Development for Food Authenticity Assessment

Workshop Programme

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Organised by: Catalysis Group

FOOD INNOVATION RI develops and provides services that will enhance the innovation capacity of companies, research centres and public bodies of the agri-food sector

To put science at the heart of societal and economic development, we need to devise strategies to push the limits of science in order to promote innovation, tackle societal challenges and deliver big results. In Europe, one such strategy is the development of research infrastructures - organizations that enable the research community to use specific facilities, resources and services, thus fostering collaboration between scientists from different countries, economic sectors, research fields, and institutions.

FOOD INNOVATION RI is a distributed national research infrastructure of Greece that aims to support research, education and innovation of the agri-food sector by implementing breakthrough research and providing access to first class facilities, knowledge and advanced services to researchers and professionals from the academic, domestic and industrial sector.

Going through its preparatory phase, it combines the facilities, knowledge and experience of high-quality research groups from 7 Universities of Greece with a complementary scientific background including food chemistry, biochemistry, microbiology, genetics, nutrition and biotechnology.

FOOD INNOVATION RI was included in the National Roadmap for Research Infrastructures in Greece in November 2016 and, two years later, initiated its activities in the city of Patras. It consists of research groups and laboratories from the University of Patras, which stands as the Central Hub, and from 6 Research Organisations of Greece operating as interlinked regional nodes. These Organisations are the University of Ioannina, the Agricultural University of Athens, the Harokopio University of Athens, the Aristotle University of Thessaloniki, the Democritus University of Thrace and the Ionian University.

Friday 19 November 2021

Valorization of Food Industry Wastes and Rapid Test Development for Food Authenticity Assessment Workshop

09:30-09:35	Opening remarks
09:35-09:50	Strategy for valorization of agro-industrial residues in the frame of circular economy
09:50-10:05	Development of biochars from agro-industrial byproducts and their ability to act as sorbents to treat water and wastewater
10:05-10:20	Upgrading of Biochars produced from agro-industrial solid residues
10:20-10:35	Biochars for the transformation of non-edible fats into renewable diesel
10:35-10:50	Development and Evaluation of “Rapid Tests”
10:50-11:05	Development of molecular rapid tests for food authentication
11:05-11:20	Mixed cheese whey from goat and sheep milk can be used for the expression of recombinant proteins by Escherichia coli
11:20-11:30	Closing remarks

09:30-09:35 Opening remarks

Christos Kordulis,
Professor,
Department of Chemistry,University of Patras, Greece

09:35-09:50 Strategy for valorization of agro-industrial residues in the frame of circular economy

Pyrolysis of solid agro-industrial wastes (spent espresso coffee grains, rice husks, grape seeds etc) was studied for biochars production. The target was to obtain materials exhibiting suitable physicochemical characteristics for applications related with environmental protection and biofuels production. The influence of pyrolysis conditions on the physicochemical characteristics of the biochars was extensively studied. Various post-treatment procedures (acid or base treatment) were applied for activation and further valorization of the biochars. The prepared materials were evaluated as:
a. Sorbents for water purification,
b. Catalyst supports for green diesel production by selective hydrodeoxygenation of waste cooking oil,
c. Catalysts for green diesel production via direct decarboxylation of waste cooking oil.

Christos Kordulis,
Professor,
Department of Chemistry,University of Patras,
Greece

09:50-10:05 Development of biochars from agro-industrial byproducts and their ability to act as sorbents to treat water and wastewater

Different biomass by-products have been pyrolyzed to prepare biochars with high surface area and good sorbent properties for organic pollutants. The effect of grain size, moisture and ash content of the raw material e.g., coffee residue versus spend rice husks, etc. has been studied related to the efficiency of the biochar production during pyrolysis as well as the effect of the original production process on the properties of the final product e.g., residues of espresso coffee versus residues from Greek coffee, or grape seeds after wine making versus grape seeds after distillation, etc. The different final products after pyrolysis and activation are tested for their ability to remove dyes in batch and column experiments. Both the development and evaluation processes were tested for upscaling to test their efficiency and robustness.

Nikos Mourgkogiannis,
PhD candidate,
Department of Chemistry,
University of Patras, Greece

Hrissi K. Karapanagioti,
Associate Professor,
Department of Chemistry,
University of Patras, Greece

10:05-10:20 Upgrading of Biochars produced from agro-industrial solid residues

Pyrolysis of agro-industrial solid residues is a promising method for wastes elimination in the frame of circular economy. Biochars produced from spent espresso coffee grains, rice husks and grape seeds, were upgraded by acid or alkali treatment. This treatment led to biochars with suitable physicochemical characteristics, in order to be used as catalyst and/or catalytic supports for biofuels production or as sorbents for water purification.

Eleana Kordouli,
Post-Doctoral Researcher,
Department of Chemistry,
University of Patras, Greece

10:20-10:35 Biochars for the transformation of non-edible fats into renewable diesel

In the frame of the protection of the environment, we aim to develop low-cost solid catalysts for exploitation of residual triglyceride-based biomass. Paving towards this target we used biochars derived by pyrolysis of residual biomass as catalyst support upgraded or not via acid or base treatment. Nickel active phase (10 wt %) was deposited on the prepared biochars using wet impregnation method. The prepared catalysts were extensively characterized and evaluated for the transformation of waste cooking oil into renewable diesel under solvent free conditions.

Ioannis Nikolopoulos,
PhD Candidate,
Department of Chemistry,
University of Patras, Greece

10:35-10:50 Development and Evaluation of "Rapid Tests"

This presentation will cover the architectural and functional aspects as well as the applications of analytical devices that enable rapid, point-of-need testing. The attractive features of these devices include simplicity, dry-reagent format, low-cost, minimal instrumentation and no requirements for highly trained personnel. Usually, the detection is performed by naked eye. The unique properties of nanoparticle reporters have contributed to the high detectability of the rapid tests. The assay configurations for various analytes, from small molecules to proteins and nucleic acids in various samples, will be discussed. Finally, the performance of the rapid tests will be compared to that obtained by conventional analytical methods.

Theodore Christopoulos,
Professor,
Department of Chemistry,
University of Patras, Greece

10:50-11:05 Development of molecular rapid tests for food authentication

Rapid strip tests are an attractive diagnostic tool due to their simplicity, rapid analysis, low cost and user-friendly format. The detection is accomplished through naked eye; thus, no expensive or special instrumentation is required. The Group of Analytical Chemistry of University of Patras has a long experience in nucleic acids analysis and analytical methods and biosensors development. Herein, the fabrication of new molecular strip-type 'rapid tests' for food authenticity testing will be presented. The rapid tests were applied for the detection of adulteration in meat, coffee and dairy products, whereas genetically modified organisms (GMOs) were also detected. Colored gold nanoparticles were exploited here as reports for visual detection and species identification. The tests offered high detectability, sensitivity, and reproducibility. Finally, another great advantage of these molecular rapid strip tests lies on the fact that they are universal, meaning that they can be applied for the detection of the adulteration of any other agri-food products.

Kalogianni Despina,
Assistant Professor,
Department of Chemistry,
University of Patras, Greece

11:05-11:20 Mixed Goat and sheep whey can be used for the overexpression of proteins by Escherichia coli

Vlamis Alexios,
Assistant Professor,
Department of Chemistry,
University of Patras, Greece

Although cheese whey contains nutrients, it is usually discarded to become an environmental pollutant. We examined whether mixed cheese whey (mCW) from goat and sheep milk could be used for the overexpression of proteins by Escherichia coli (E. coli). The composition of mCW (glucose, lactose, galactose, lactic acid, succinic acid, total nitrogen content), showed that it has the potential for bacterial growth. Its increased turbidity, however, did not allow easy measurement of cell growth. A mCW clarification protocol was devised and the clarified medium was used to overexpress the model proteins thioredoxin 1 from E. coli and the flavoprotein thioredoxin reductase from Plasmodium falciparum. Levels of overexpression (by SDS-PAGE) in mCW were similar to those from bacteria grown in LB medium.

11:20-11:30 Closing remarks

Christos Kordulis,
Professor,
Department of Chemistry,University of Patras, Greece

Speaker and Chair Biographies

Theodore Christopoulos,
Professor,
University of Patras, Greece

Theodore Christopoulos is a professor of Analytical Chemistry in the Department of Chemistry, University of Patras (since 1999), and a collaborating faculty member, ICEHT/FORTH (since 2000). His research activity is multidimensional, covering areas such as nanoparticle-based sensors, microanalytical devices (chips), fluorescence/time-resolved fluorescence spectroscopy, bio(chemi)luminescence, electrochemistry, technology for the analysis of DNA, RNA and proteins. The applications of his research focus on the Health Sector and the Food Sector and include diagnostics, pathogen detection, pharmacogenomics, pharmaceutical analysis and food authenticity testing.

Kalogianni Despina,
Assistant Professor,
University of Patras, Greece

Dr. Despina Kalogianni has a great experience in nucleic acids analysis and species identification. Her research is focused on the combination of analytical chemistry and nanotechnology, especially in the construction of biosensors in conjunction with molecular techniques. She has developed novel, simple, sensitive and rapid analytical methods and biosensors for specific DNA sequences detection and identification. Through her research activity, she aims to develop analytical methods and technologies to address important and pressing societal challenges in the field of agri-food and health, such as detection and identification of different microorganisms (pathogens) and genetically modified organisms in a variety of samples, molecular food testing, food authentication – different species

Hrissi K. Karapanagioti,
Associate Professor,
University of Patras, Greece

Hrissi K. Karapanagioti is an Associate Professor of Environmental Chemistry. She has joined the Department of Chemistry, University of Patras, Greece since 2007. Her expertise related to FOOD INNO is on biochar development and sorption process but is also expert on microplastic formation and their interaction with microorganisms and organic pollutants.

Eleana Kordouli,
Post-Doctoral Researcher,
University of Patras, Greece

Chemist, MSc in Catalysis for Environmental Protection and Clean Energy Production Ph.D., Post-doctoral Researcher. Her research interests are focused on catalysts; biochar; green diesel; catalyst supports.

Christos Kordulis,
Professor,
University of Patras, Greece

Dr. Christos Kordulis is professor of Catalysis at the Department of Chemistry of the University of Patras. He is also collaborating faculty member of the Institute of Chemical Engineering Sciences (ICE-HT/FORTH) as well as Director and tutor at the Hellenic Open University for the M.Sc. program entitled “Catalysis and Protection of the Environment”.

Nikos Mourgkogiannis,
PhD candidate,
University of Patras, Greece

Ioannis Nikolopoulos,
PhD Candidate,
University of Patras, Greece

Chemist, MSc in Catalysis for Environmental Protection and Clean Energy Production, Ph.D. candidate. His research interests are focused on catalysts; biochar; renewable diesel; catalyst supports.

Vlamis Alexios,
Assistant Professor,
University of Patras, Greece

Vlamis Alexios is an Assistant Professor of Biochemistry and Molecular Biology at the Department of Chemistry, University of Patras since May 2011. With a background in Biology (degree) and in Biochemistry and Molecular Biology (postgraduate, doctoral, postdoctoral and extensive research), Alexios Vlamis focuses on biochemistry topics related to the flow of electrons through thiols, and the discovery of novel antimicrobial compounds. Current research is centered on the interactome of thioredoxins and glutaredoxins and the discovery of species-specific antimicrobial peptides.

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European Union
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